# Paediatric patient stratification in the emergency department

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At the UNICEF and WHO's Leading Minds Conference in November, 2019, Vikram Patel, the corresponding author of this study, threw down a gauntlet to the field of mental health: the overwhelming majority of children who already have mental health problems receive no recognition, nor any form of intervention that we know can transform their lives.[7] The PRIDE programme of research aims to develop low-cost scalable interventions for adolescents, and test them rigorously in high-poverty educational contexts. Sangath—the non-governmental organisation leading this work—makes their interventions publicly and freely available online, setting a standard for other researchers and developers. Their work provides a strong argument that mental health programmes developed by researchers should never be commercialised, but instead be considered a public good.

The next challenge is achieving sustainability and scale, which will mean building coalitions with policy makers, funders, and advocacy groups, and further bridges beyond the health sector. Sustainability and scaling up might require new research and testing of the effects of low-cost mental health interventions across Sustainable Development Goal outcomes beyond health, such as school achievement, employment, and gender equality.[8] Expanding beyond India will also require careful assessment of acceptability and effectiveness in other low-resource regions.

This study, and the wider programme of research that it is part of, are important steps to reaching adolescent mental health-care provision at scale.

I declare no competing interests.



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# Paediatric patient stratification in the emergency department

With the rapid growth of large paediatric emergency departments (EDs) in the past two decades, accurate and timely risk stratification of patients is one of the key challenges faced by ED health-care professionals on a daily basis. Overall acuity in paediatric EDs remains substantially lower than in adult practice, and severe incidents such as multiple trauma or cardiac arrest represent, in comparison, rare occurrences. At the same time, life-threatening conditions such as sepsis frequently manifest initially with features similar to a broad range of mild and common febrile illnesses, adding to the complexity of decision making. The COVID-19 pandemic has shown the pressure frontline hospital staff working in acute care settings are regularly exposed to and the associated risks related to capacity limitations, rapid staff turnover, fatigue, and information gaps. Many centres have aimed to use systematic approaches to patient assessment to reduce the variability of care and improve outcomes. Such tools can be specific for triage,[1] applicable to general patients,[2] or optimised for certain patient groups (eg, those with trauma or sepsis).[3]

In *The Lancet Child & Adolescent Health*, Joany Zachariasse and colleagues[4] report on a novel ED Paediatric Early Warning Score (ED-PEWS). The score was derived from a five-centre prospective European study involving 119 209 children presenting to EDs in four countries. A priori, the investigators restricted analyses to heart rate, respiratory rate, oxygen saturation, consciousness, capillary refill time, work of breathing, temperature, and pain score. Data on blood pressure were not included. Using ordinal logistic regression, a seven-item-score

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was derived with high, intermediate, and low urgency defined as outcomes. Only 1·7% of patients in the study cohort were classed as high urgency, whereas 24·4% were classed as intermediate urgency, the latter group consisting of a range of conditions requiring hospital admission, such as for the administration of intravenous medication or fluids, inhalational treatment in the ED, or patients undergoing radiology or laboratory tests. The discrimination of this new ED-PEWS compared favourably with two previous PEWS models, albeit the 95% CIs overlapped. Although the relevance and face validity of the chosen outcomes are subject to debate, the new score had improved prediction of intensive care unit admission (c-statistic 0·83, 95% CI 0·79–0·87) compared with other PEWSs (0·79, 0·71–0·87 and 0·78, 0·72–0·85). Additionally, prediction for high-urgency patients improved from 0·84 (95% prediction interval 0·76–0·91) for the Manchester Triage System alone, to 0·90 (0·83–0·96) for this system in combination with the ED-PEWS. However, the performance of the score to distinguish children in the high-urgency and intermediate-urgency groups versus the low-urgency group was only moderate (c-statistic 0·67, 95% prediction interval 0·61–0·73).

The value of the study lies in the multinational real-life cohort providing proof of feasibility of applying PEWS-adapted and physiology-based scores to the ED. Unfortunately, the datasets used appear to have a high rate of missing data, with data missing for heart rate for 43% of patients and respiratory rate for 52%. In this context, the use of imputation and the absence of extensive external validation warrant further caution in the interpretation of the findings.

The study highlights several challenges and opportunities towards refining available paediatric ED warning systems,[5] which might serve to inform a roadmap towards next-generation tools for triage and recognition of deteriorating children. First, substantial patient heterogeneity in terms of complexity and acuity (eg, the proportion of children with major chronic health conditions) suggest a need for rigorous external validation. Second, independent validation in different health-care settings (eg, tertiary EDs with a high proportion of children *vs* mixed adult–paediatric facilities in regional areas) is paramount. Further differences may stem from available resourcing and epidemiology across high-income versus low-income settings. Third, the foundation of clinical decision-making often lies in repetitive assessment of patients or their vital signs, or both. Trends towards worsening of scores despite appropriate treatment are likely to be more indicative of a severe disease than a one-off abnormal vital sign such as the quick Sequential Organ Failure Assessment score.[6] Learning algorithms integrating patient and vital sign information carry enormous potential to enhance timely recognition of deteriorating patients in EDs.[7] Finally, the delicate interplay between such data-driven approaches and human factors at the bedside will still hinge on the creation of shared mental models among team members to lead to the best outcomes.[8]

Thanks to the availability of large electronic health databases containing high-resolution data on hundreds of thousands of patients, novel algorithms are expected to enable early identification of children on a trajectory of deterioration. Implementation studies should carefully investigate the uptake at the human–machine interface, explore explainability, and assess balancing measures related to over-triggering.

We declare no competing interests.

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